

PATENT SPECIFICATION



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COMPLETE SPECIFICATION

Improvements in or relating to Multiple Glass Sheet Units

I, AUGUST RUNNERSTRÖM, a subject of the King of Sweden, of Roslagsgatan 8, Stockholm, Sweden, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The present invention relates to a single unit multiple glass sheet construction, comprising two or more sheets of glass spaced apart so as to form one or more chambers which are hermetically sealed from the surroundings and are filled with dry air or other non-condensable transparent gas. More particularly the invention relates to a method of filling such units with dry gas.

In the manufacture of double glazed windows of the kind set forth it is known to remove existing moisture from the space between the glass sheets by passing for some time a stream of dry air or other gas through the said space, the dry air being introduced through one hole provided in the spacer frame between the glass sheets and being removed through a second oppositely positioned hole in the frame by means of needle-shaped mouth-pieces which are inserted in the respective holes. A particularly rapid drying of the space is then obtained if the dry air current is sucked through the space, so that the space is subjected to a vacuum during the drying period. After completed drying the mouth-pieces are pulled out from the respective holes and the latter sealed in suitable manner, whereupon the window is ready to be taken into use.

In practice it has been found to be difficult to prevent, during the short time in which the space between the glass sheets is in direct communication with the outer atmosphere after the pulling out of the mouth-pieces, moisture from seeping from the outside of the window into the interior space and mixing with the dry air contained therein, so that the whole drying process will be incomplete and so without effect. The present invention has for its object to avoid said inconvenience by raising the pressure of the dry air or the like in the space between the glass sheets

before pulling out the respective mouth-pieces, ensuring that dry air will be streaming from within and outwards through the holes until the latter have become permanently sealed, thereby effectively preventing the penetration of moisture through the holes into the space.

An embodiment of the invention in a double glazed window is illustrated in the accompanying drawing. In the drawing, the reference numeral 1 indicates one of the two glass-sheets and the reference numeral 2 the spacer frame, preferably made of a thermoplastic material, such as artificial resin, to which frame the two glass sheets are bonded by means of strips of an artificial resin (e.g. that known as "Plexi") film or other bonding means capable of producing a permanent air tight joint, so that the space between the glass sheets becomes hermetically sealed from the outer atmosphere. The reference numeral 3 indicates an air drying apparatus filled with calcium chloride or other drying agent, said air drying apparatus communicating by means of a hose line 4 and a conically tapering mouth-piece 5 adapted to be inserted in an air tight manner into a hole 6 adjacent one corner of the frame, with the space between the glass sheets. Said communication may be interrupted by means of a turn-valve 7 or the like. Connected to the air intake side of the air drying apparatus 3 is a normally inoperative air pressure pump 8. At a point placed diametrically opposite to the hole 6 the spacer frame 2 is provided with a second hole 9 into which may be airtightly inserted a conical mouth-piece 10 positioned at one end of a hose 11 the other end of which is connected to a suction device represented in the drawing by an ejector 13 connected to a house water supply pipe 12. The reference numeral 14 indicates a stop valve.

The apparatus shown in the drawing is used in the following manner. After opening the water pipe tap the valves 7 and 14 are opened, causing a current of air to be sucked through the drying apparatus 3 and thereafter in the form of a dry air current diagonally through the

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space between the glass sheets, the moisture contained in the said space being then taken up by the dry air and carried away to the outer atmosphere. After the lapse of a suitable time the space between the glass sheets is completely dried out. The valve 14 is now closed, whereupon dry air is pressed into the space between the glass sheets by means of the pressure pump 8 until a suitable super pressure, for instance a super pressure of .15 atmospheres, is obtained in the entrapped air. The suction mouth-piece 10 is now pulled out of its hole 9 and is rapidly replaced with a plug of a suitable thermoplastic material the surface of which has been brought to a melting condition, so that the hole becomes hermetically sealed in a permanent manner. On account of the super pressure of the dry air contained between the glass sheets (dry air will be flowing out through the open hole 9 during the entire time during which the space between the glass sheets is in direct communication with the external air through the said hole, whereby moisture is effectively prevented from flowing in an opposite direction from without into the space. After the plugging of the hole 9 has been completed a further quantity of dry air is pressed into the space by means of the pressure pump 8, so that the super pressure within the space resumes the desired value, whereupon the valve 7 is closed, the mouth-piece 5 is pulled out of its hole 6 and said hole is rapidly plugged in the same manner as was the hole 9. Also at this time dry air will flow out through the hole and prevent seepage of moisture into the space between the glass sheets.

It should be noted that the super pressure, which the entrapped dry air must have before it is permissible to pull out the respective mouth-pieces, depends upon the diameter of the holes and upon the value of the entrapped air. If the diameter of the holes is small, for example of the order of magnitude of 1 to 2 millimetres, the super pressure may for windows of ordinary size be kept low, for example at .15 atmospheres, whereas for greater holes and for windows having an air space of smaller volume it may be necessary to select a higher super pressure to secure that the super pressure will not have time to become equalized and cause the flowing out of dry air to cease before the holes have become permanently sealed.

The invention is not limited to the embodiment shown but various modifications are conceivable without receding from the idea of the invention. It is, for example, conceivable to raise the pressure

of the entrapped gas in other manner than by impressing a further quantity of gas, for example by raising the temperature of the entrapped gas. Furthermore, it is possible to use for the introduction of the dry air or the like other introducing means than conically shaped mouth-pieces, and the holes for introducing the gas may be provided in the glass sheets proper, etc.

It is also clear that the method according to the invention of filling a sealed space with a dry gas is not restricted in its application to the manufacture of multiple glass sheet constructions comprising a spacer frame between the individual glass sheets, but it may be employed also in cases where the two or more plane or bent glass sheets are made in one piece. Furthermore, the invention may find application not only in the manufacture of multiple glass windows for ordinary purposes but also in the manufacture of windows for helmets for submarine armors, for gas masks and the like, and generally in every case where it is desired to provide a hermetically sealed space with an absolutely dry gas filling.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A method of producing a single unit multiple glass sheet construction of the kind in which the space or spaces between the glass sheets form one or more chambers which are hermetically sealed from the surroundings and are filled with dry air or other non-condensable transparent gas by introducing such gas into the said space or spaces with the aid of mouth-pieces co-operating with holes which are subsequently sealed, characterized in that before a mouth-piece is pulled out of its hole and is replaced by a sealing plug or other permanent sealing member the pressure of the entrapped gas is raised so much, for example to a super pressure of .15 atmospheres, that a flow of dry gas from within and outwards through the hole is secured during the entire time during which the space between the glass sheets is in direct communication with the outer atmosphere through the hole, so that the penetration into the sealed space of moisture through the open hole is effectively prevented.

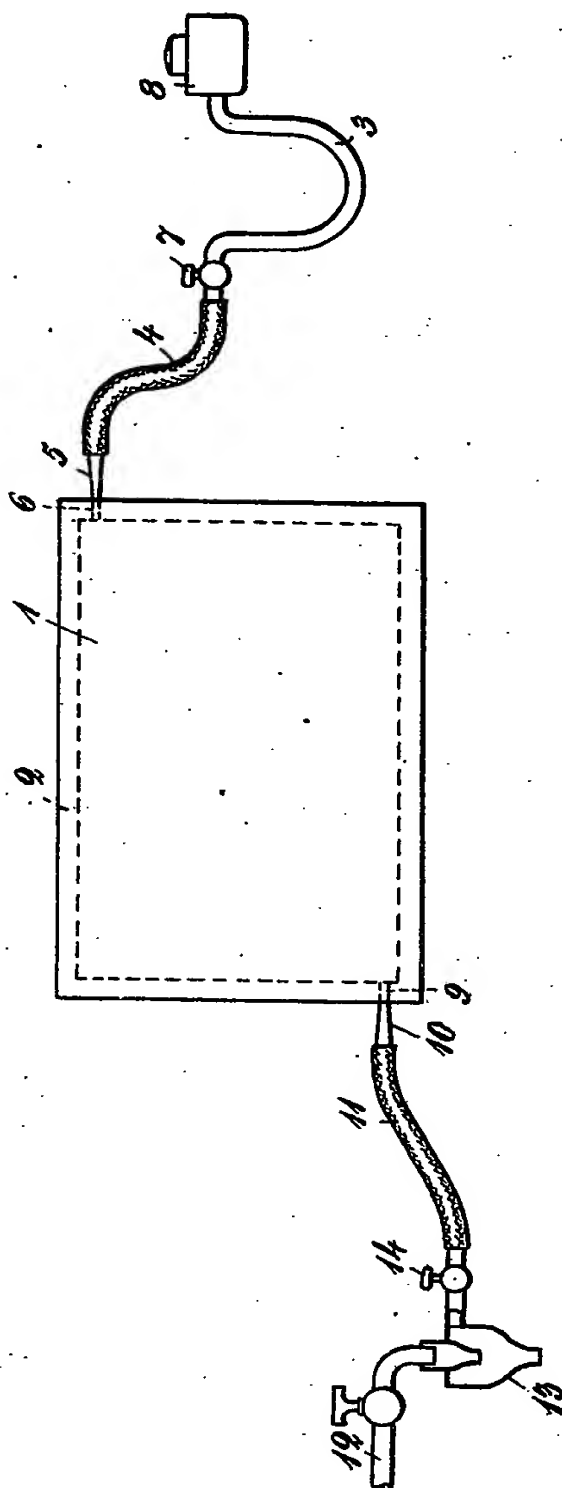
2. A method as claimed in claim 1, characterized in that the pressure is raised to the desired value by impressing a quantity of dry gas of the temperature of the surroundings into the said space or spaces by means of a pressure pump or the like.

3. A method as claimed in claim 2, in which the previous drying of the space between the glass sheets is effected by sucking a dry gas current through the space, characterized by interrupting the connection with the suction source after the completion of the drying, raising the pressure of the dry gas entrapped in the space or spaces between the glass sheets by means of a pressure pump, pulling out the suction mouth-piece and sealing the suction hole, impressing a further quantity of dry gas into the space or spaces, pulling out the air impressing mouth-piece, and sealing the corresponding hole.
4. A method as claimed in any of the claims 1 to 3, characterized in that holes of small diameter, for instance of the order of magnitude of 1 to 2 millimetres, are employed.
5. A method of manufacturing multiple glass sheet units, substantially as herein described with reference to the accompanying drawings.
6. A multiple glass sheet unit manufactured according to the method of any of the preceding claims, and substantially as hereinbefore described.
- Dated this 10th day of September, 1942.
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[This Drawing is a reproduction of the Original on a reduced scale.]



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